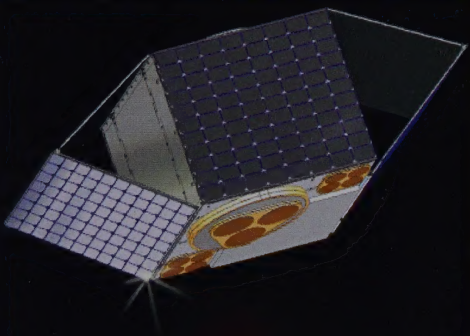


EAGLE

a new era in amateur satellite communications

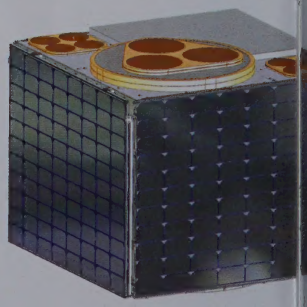
AMSAT®

AMSAT-NA's Vision "is to deploy high earth orbit satellite systems that will offer daily coverage by 2009 and continuous coverage by 2012."

AMSAT is actively seeking to complete this ambitious goal by developing and launching a new **Eagle**-class of satellites. The first satellite is expected to be launched by 2009 with the second satellite by 2012. These two satellites, along with the development and launch of AMSAT-DL's **Phase 3-Express** (which AMSAT-NA is also actively supporting), will provide unsurpassed satellite capabilities for amateur radio operators around the world.

AMSAT-NA's Eagle-class of satellites will be placed in High Earth Orbit (HEO). Eagle will incorporate capabilities that have become standard on HEO amateur satellites, such as transponders using 145 MHz downlink, 435 MHz uplink, 1.2 GHz uplink, and 2.4 GHz downlink and will be capable of both digital and analog (voice/cw) modes. Amateurs who have traditional satellite stations applicable for earlier generation HEO satellites (such as AO-40) will be able to use Eagle as is.

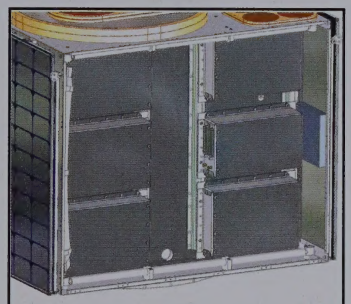
The Eagle-class satellites will also incorporate several new exciting features and will leverage new technology. Foremost is the development of new capabilities on C-band (5.6 GHz) where AMSAT is simultaneously developing both the satellite transponder and the ground station equipment necessary to use this new band. Preliminary work already completed suggests that we can develop a low-cost, portable-size ground station featuring both voice and digital modes.



Eagle with solar panel
launch configuration

Help Hatch Eagle!

Our goal is to make it possible for an apartment dweller to use the satellite on C-band by setting up a modem size box connected to a computer and feeding to a small dish or flat-panel antenna. The ground station design is based upon an open source technology developed by GNU Radio. The C-band transponder design is nicknamed "C-C Rider" to reflect the fact that both the uplink and downlinks will be on C-band. The use of the C-C Rider design offers a number of advantages, the most important being the ability to use the satellite with smaller antennas as well as allow the electronics to automate much of the functions necessary for good satellite communications, such as steering of the ground station's C-band antenna and automatic Doppler correction. We will also take advantage of the allowable bandwidth to maximize the opportunities for both voice and digital data.



Solar panels removed revealing the new IHU3 computer module

Eagle will incorporate a Software Defined Transponder (SDX) design featuring AMSAT's implementation of Software Defined Radio (SDR) based on the Quadrature Sampling Detector. The use of this new technology for all of the transponders will offer a number of advantages:

- Improved receiver performance (dynamic range)
- The ability to program configuration changes while in orbit
- Less weight vs. traditional analog transponders for the same performance levels
- Integration of uplink and downlink bands via digital connections.

Eagle's Key Features

Size

600mm (L) x 600mm (W) x 465mm (H)

Expected Launch Weight

53kg (133 lbs)

Power Subsystem

- Bus voltage of 10 to 14 VDC nominal
- Up to 125 Watts from four deployable solar panels and two fixed solar panels
- Highly efficient power storage
- Charge regulation.

Attitude Control

- Stabilization - Eagle will be spin stabilized about its center of mass with antennas pointed towards the center of earth at apogee
- Magnetorquers and nutation dampers
- Sun and earth sensors.

Orbital Characteristics

Several low risk propulsion options are being explored to raise perigee from the low inclination Geostationary Transfer Orbit (GTO) that the launch vehicle will initially place the satellite. Raising perigee is required to keep the satellite in orbit. The expected final orbit is an apogee of 35,000 km with a perigee of 500 km. Each orbit will take about 10.35 hours to complete.

RF Bands

Uplinks	Downlinks
U-band 435 MHz, 70 cm	V-band 145 MHz, 2 m
L-band 1.2 GHz, 23 cm	S-band 2.4 GHz, 13 cm
C-band 5.6 GHz, 6 cm	C-band 5.6 GHz, 6 cm

Antennas

- High Gain (+Z axis): U, L, S and C-bands
- Omni Gain (-Z axis): V, U, L, and S-bands
- Omni Gain (+Z axis): U, L, and S-bands.

Additional Features

- Telemetry beacons active on all transmitters
- Command uplinks on U and L-band
- Two cameras (wide and narrow angle)
- Newly designed Internal Housekeeping Unit (IHU-3)
- CAN-Do! bus structure eliminates the bulk of traditional point-to-point wiring between modules.

Why Place a Satellite in High Earth Orbit?

A high earth orbit (HEO) satellite provides a footprint that covers a significant portion of the earth's surface. Hams in North America will be able to communicate with amateurs in Europe and Asia depending upon the satellite's position relative to the user. Due to the amount of time it takes to complete an orbit, HEO satellites also provide long periods of time when the satellite is in view. This means that operators will be able to utilize each HEO satellite for hours at a time as the satellite's relative position moves slowly from horizon to horizon. AMSAT's goal is to provide continuous satellite coverage by launching two Eagle-class satellites along with the launch of AMSAT-DL's Phase 3-Express. This has the intended result of at least one of the satellites being in view of a given position on the ground at all times.

A primary concern today is the ability of amateurs to enjoy their hobby while living in deed-restricted areas or in apartments where antenna options are limited. This is not the case with Eagle, which is being designed to be accessed by small ground stations on C-band.

Think of the other possibilities that Eagle offers:

- Multiple operators using the satellite simultaneously conducting independent contacts thanks to the use of wide band transponders
- Simultaneous operation of two transponders (such as C-C Rider and U-band uplink/ V-band downlink) at the same time
- Assets that are available for support of **emergency communications** around the world at all times using both analog and digital modes
- Capabilities to attract new operators to the Amateur-Satellite Service and build a foundation for future support for amateur radio in space.

To build and launch Eagle requires YOUR generous financial support. AMSAT has embarked on a project that will require funding each year through the end of this decade. Please help us to hatch Eagle and turn this vision into a reality. To be successful, we are counting on your continuing donations to the AMSAT EAGLE FUND. You may donate to Eagle via several means:

- **Visit the AMSAT Website at www.amsat.org**
- **Via PayPal sent to martha@amsat.org**
- **Call AMSAT toll free at +1 888.322.6728 within the United States and Canada**
- **Call AMSAT at +1 301.589.6062 outside the United States and Canada**
- **Mail your check directly to AMSAT.**

Your Eagle donations at any President's Club level also qualify you for President's Club status and provides for 12 automatic monthly payments using your credit card.

Your generous contribution to AMSAT will help ensure that our common dream will indeed become a reality.

AMSAT - NA is a 501(c)(3) scientific and space education organization.

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